GRY-118US

Appln. No.: 10/779,900
Amendment Dated October 6, 2006
Reply to Office Action of June 9, 2006





**Remarks/Arguments:**

**Claim Status:**

Claims 1-9 are pending in the above-identified application. Claim 10 has been cancelled without prejudice or disclaimer of the subject matter thereof.

Claim 1 has been amended to recite a method of displacing a mobile magnetic plate of an electromechanical valve actuator for internal combustion engines from a second position to a first position. Generally speaking, the electromechanical valve actuator comprises a first polarized electromagnet, a second polarized electromagnet, and a mobile magnetic plate configured for switching between a first position close to the first electromagnet and a second position close to the second electromagnet. The method of displacing the mobile magnetic plate from the second position to the first position comprises the step of supplying the first electromagnet with a variable attracting current. The variable attracting current increases progressively to a peak value in the course of the approach of the plate to the first electromagnet. The variable attracting current is immediately decreased after the peak value is achieved, and decreases when the magnetic plate contacts the first electromagnet (see Paragraph [0045] and Figure 3B).

The method of displacing the mobile magnetic plate from the second position to the first position further comprises the step of supplying the second electromagnet with a second current generating a magnetic field opposite to the magnetic field of the magnet of the second electromagnet in order to demagnetize the magnet of the second electromagnet. The intensity of the second current is lower than or equal to the intensity of the magnetic field generated by the magnet of the second electromagnet. The second current is generated at least until the mobile magnetic plate has traveled about one-half of the distance separating the first electromagnet from the second electromagnet (see Paragraphs [0060]-[0063] and Figures 5B and 6B). No new matter has been added.

**Claim Rejection Under 35 U.S.C. § 102(b):**

Claims 1, 2, 5, 7, 9 and 10 are rejected under 35 U.S.C. § 102(b) as being anticipated by Wright et al. (U.S. Patent No. 6,285,151). Applicants respectfully request reconsideration of the rejection of these claims and respectfully submit that these claims are patentable over Wright et al. for the reasons set forth below.

Independent claim 1 recites several limitations that are neither disclosed nor suggested by Wright et al., namely:

> a first polarized electromagnet and a second polarized electromagnet, each polarized electromagnet including a magnet,
>
> the ***variable attracting current*** is immediately decreased after the peak value is achieved, and is ***decreasing when the magnetic plate contacts the first electromagnet***, and
>
> supplying the second electromagnet with a ***second current*** generating a magnetic field opposite to the magnetic field of the magnet of the second electromagnet in order to temporarily ***demagnetize the magnet of the second electromagnet***, the second current being of an intensity lower than or equal to the intensity of the magnetic field generated by the magnet of the second electromagnet, wherein the second current is generated at least until the mobile magnetic plate has traveled about one-half of the distance separating the first electromagnet from the second electromagnet. [emphasis added]

As background and according to one exemplary embodiment, the electromechanical valve actuator of the instant matter is configured to controllably translate a mobile magnetic plate between opposing polarized electromagnets. By virtue of its design, the valve actuator is adapted to control the magnetic plate with increased sensitivity (see Paragraph [0016]), reduce the velocity of impact between the magnetic plate and an electromagnet in an effort to reduce the noise generated by the impact (see Paragraph [0022]), and improve energy efficiency through the incorporation of a polarized electromagnet (see Paragraph [0023]).

Wright et al. disclose an electromagnetic actuator comprising opposed electromagnets 12 and 18, and a spring loaded armature 24 movably positioned between the electromagnets, as shown in Figures 1 and 2. Each electromagnet 12 and 18 includes a stator core 14 and 20, and a solenoid coil 22 and 16, respectively.

Wright et al. teach that "[i]n order to obtain a soft-landing of the armature against the stator core, power may be removed from the coil as the armature approaches the stator in the second position. **The stator coil may then be re-energized, just before landing the armature, to draw and hold the armature against the stator core**" (Column 1, Lines 38-43). Because the power to the stator coil is increased immediately prior to contact between the plate and the electromagnet, Wright et al. do not disclose the step of decreasing the variable attracting current when the magnet plate contacts the first electromagnet, as recited in claim 1.

Furthermore, electromagnets 12 and 18 disclosed in Wright et al. are not polarized, i.e. do not include a permanent magnet. Because the electromagnets are not polarized, it follows that Wright et al. do not disclose the step of supplying an electromagnet with a second current (i.e., a release current) generating a magnetic field opposite to the magnetic field of a **magnet** of the electromagnet.

Accordingly, for the foregoing reasons, Applicants respectfully submit that independent claim 1, as amended, is patentable over Wright et al. and should be allowed. Claims 2, 5, 7, and 9 are dependent upon claim 1, and therefore should also be allowed at least as dependent upon an allowable base claim. Reconsideration of claims 1, 2, 5, 7, and 9 is respectfully requested.

**Claim Rejection Under 35 U.S.C. § 103(a):**

Claims 3 and 4 stand rejected under 35 U.S.C. § 103(a) as being anticipated by Wright et al. in view of Curtis et al. (U.S. Patent No. 6,532,919). Applicants respectfully request reconsideration of the rejection of these claims and respectfully submit that these claims are patentable over Wright et al. and Curtis et al., alone or in combination, for the reasons set forth below.

Claims 3 and 4 depend from claim 1. As explained above, Wright et al. fail to disclose or suggest a polarized electromagnet, the step of supplying the second electromagnet with a second current, and the step of decreasing the variable attracting current when the magnet plate contacts the first electromagnet. Curtis et al. fail to overcome the deficiencies of Wright et al. for at least three reasons, as explained in greater detail below.

Curtis et al. disclose an electromagnetic valve actuator comprising an electromagnetic coil 24 positioned between two spring loaded armature plates 16 and 18. The electromagnetic coil 24 is not polarized, thus, Curtis et al. do not disclose or suggest a first polarized electromagnet and a second polarized electromagnet, as recited in claim 1.

Second, as shown in Fig. 5 of Curtis et al., after the current reaches a peak value, the peak value is held before decreasing the current (see current "B", "D", "F" and "H" in Fig. 5). Thus, Curtis et al. do not disclose or suggest the step of immediately decreasing the variable attracting current after the peak value is achieved, as recited in claim 1.

Third, Curtis et al. disclose the step of reversing the current in the electromagnetic coil 24 to ***create an opposing force*** between the electromagnet and an armature plate (see Column 3, Lines 32-38). The aforementioned step is wholly different from the step recited in claim 1 of supplying a second electromagnet with a second current generating a magnetic field opposite to the magnetic field of the magnet of the second electromagnet ***in order to temporarily demagnetize*** the magnet of the second electromagnet. The step of supplying the second current to the second electromagnet recited in claim 1 merely demagnetizes the magnet of the second electromagnet, whereas in Curtis et al. the electromagnet current is reversed to propel the armature plate away from the electromagnet.

Thus, Curtis et al. fail to overcome the deficiencies of Wright et al. Accordingly, because claims 3 and 4 include limitations that are neither disclosed nor suggested by Wright et al. or Curtis et al., alone or in combination, prima facie obviousness cannot be established based on the cited references. Reconsideration of claims 3 and 4 is respectfully requested.

Claim 6 stands rejected under 35 U.S.C. § 103(a) as being anticipated by Wright et al. in view of Kawamura (U.S. Patent No. 5,111,779). Applicants respectfully request reconsideration of the rejection of this claim and respectfully submit that this claim is patentable over Wright et al. and Kawamura, alone or in combination, for the reasons set forth below.

Claim 6 depends from claim 1. As explained above, Wright et al. fail to disclose or suggest two polarized electromagnets, the step of supplying the second electromagnet with a

second current, and the step of decreasing the variable attracting current when the magnet plate contacts the first electromagnet. Kawamura fails to overcome the deficiencies of Wright et al., as explained in greater detail below.

Kawamura discloses an electromagnetic valve actuator comprising a magnetic body 4, a plurality of coil sets 5, 6, and 7 positioned about the magnetic body 4, a permanent magnet 3 positioned on the magnetic body 4, and a movable magnetic pole 8a that translates with respect to permanent magnet 3 to either open or close the valve. The relative positions of movable magnetic pole 8a and permanent magnet 3 depend upon which coil sets (i.e. either coil sets 5, 6 or 7) of the actuator are activated, as shown in Figures 3a-3d.

Kawamura does not disclose a second polarized electromagnet, as recited in claim 1. Second, Kawamura does not disclose or suggest the step of immediately decreasing the variable attracting current after the peak value is achieved, as recited in claim 1. For example, in the open position of the valve (see Figure 3(c) and numeral II shown in Figure 4), coil 6 remains activated for an extended period of time to hold the valve in an open position.

Third, Kawamura does not disclose the step of supplying a second electromagnet with a second current generating a magnetic field opposite to the magnetic field of the magnet of the second electromagnet ***in order to temporarily demagnetize*** the magnet of the second electromagnet, as recited in claim 1. Specifically, Kawamura does not disclose or suggest that permanent magnet 3 is demagnetized by the coils.

Finally, Examiner contends that the permanent magnet forms the middle portion of the "E" shaped support (see Page 4 of the Office Action). However, claim 6 recites that "the magnet of each electromagnet is located at the end of one of the branches of the support." Claim 1 does not recite a magnet forming a branch of the "E" shaped support, rather, claim 1 recites a magnet located on an end branch of an "E" shaped support.

Thus, Kawamura fails to overcome the deficiencies of Wright et al., and fails to disclose or suggest every limitation of claim 6. Accordingly, because claim 6 includes limitations that are neither disclosed nor suggested by Wright et al. or Kawamura, alone or in combination, prima facie obviousness cannot be established based on the cited references. Reconsideration of claim 6 is respectfully requested.

Claim 8 stands rejected under 35 U.S.C. § 103(a) as being anticipated by Wright et al. in view of Hattori et al. (U.S. Patent No. 6,334,413). Applicants respectfully request reconsideration of the rejection of this claim and respectfully submit that this claim is patentable over Wright et al. and Hattori et al., alone or in combination, for the reasons set forth below.

Claim 8 depends from claim 1. Independent claim 1 recites at least two limitations that are neither disclosed nor suggested by Wright et al. or Hattori et al., in combination, namely:

> the variable attracting current is immediately decreased after the peak value is achieved ... , and
>
> the second current is generated ***at least until the mobile magnetic plate has traveled about one-half of the distance*** separating the first electromagnet from the second electromagnet. [emphasis added]

Hattori et al. describe an electromagnetic actuating system for actuating a valve member. The electromagnetic actuating system includes an armature 38 that moves with the valve member 12, an electromagnet that attracts the armature when supplied with current, and a spring that presses the armature away from the electromagnet. A permanent magnet exerts magnetic attracting force between the armature and the electromagnet. A current controller supplies a release current to the electromagnet so that magnetic flux is generated in a direction opposite to the direction of the magnetic flux generated by the permanent magnet to release the armature from the electromagnet.

As stated in the previous response, as shown in Fig. 5B of Hattori, the attracting current does not increase progressively to a peak value and then immediately decrease from the peak. Instead, Hattori et al. disclose in Fig. 5B that the current rises quickly to the peak value and holds this value until the valve is fully opened; only then does the current decrease. Thus, Hattori et al. do not disclose the limitation "the variable attracting current is immediately decreased after the peak value is achieved" recited in claim 1.

Furthermore, referring still to Figure 5B of Hattori, the release current (referred to as the second current in the instant matter) is disabled well before the mobile plate has ***traveled half of the distance*** between the "FULLY CLOSED" position and the "FULLY OPEN" position.

Thus, Hattori et al. fail to overcome the deficiencies of Wright et al., and both references fail to disclose or suggest every limitation of claim 8. Accordingly, because claim 8 includes limitations that are neither disclosed nor suggested by Wright et al. or Hattori et al., alone or in combination, prima facie obviousness cannot be established based on the cited references. Reconsideration of claim 8 is respectfully requested.

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**Conclusion:**

In view of the foregoing amendments and remarks, Applicants request that the Examiner reconsider and withdraw the rejection of claims 1-9.

Respectfully submitted,

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October 6, 2006
Patricia C. Boccella

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